APPENDIX E – A RAILROAD FUNDING BENEFIT METHODOLOGY

Presented herein is a methodology that will help to analyze the benefits for future railroad infrastructure projects being considered for funding. The following is a description of the railroad investment methodology spreadsheets. This evaluation has been developed in order to compare two alternatives. The first alternative is the proposed Project, for example, rehabilitation of a short line railroad. The second is the No-Project alternative defined as the best estimate of what will happen if the project is not undertaken or the line is abandoned all together. The No-Project alternative assumes a shift to truck transportation.

The spreadsheets show annual impacts.

EXAMPLE CASE

In order to demonstrate how the spreadsheets function, an example case has been developed. Spreadsheets having data reflecting the Example Case are included herein. Although the Example Case uses fictitious numbers, the length of the short line railroad (33 miles) is the average length of Indiana short lines, and the total tonnage involved (165,000 tons) represents a 50-car-per-mile traffic base.

The following are the parameters of the Example Case.

Project Case (Short Line railroad remains in operation)

- Commodities transported:
  - Corn 65,000 tons
  - Wheat 100,000 tons
- Distance hauled to Class I railroad interchange:
  - Corn 33 miles
  - Wheat 16 miles
- Average truck distance from farms to short line railroad elevators:
  - Corn 5 miles
  - Wheat 4 miles

No Project Case (Short Line discontinues operation)

- Commodities transported:
  - Corn 65,000 tons
  - Wheat 100,000 tons
- Average distance to Class I railroad elevator:
  - Corn 100 miles
  - Wheat 75 miles

ECONOMIC BENEFITS AND COSTS

Project Transportation Costs

This spreadsheet quantifies the difference in transportation costs that will occur should the No-Project program be implemented. The Project spreadsheet accounts for both the truck transportation used to get the commodities from farm to short line railroad elevators and the railroad transport necessary to get the commodities to a Class I interchange. Determining a common end point for both the Project and No-Project options is highly subjective. For the sake of example, transport to a Class I railroad was chosen as a common endpoint for both cases (for truck, to an elevator on the Class I; for the short line, an interchange track).

Values are provided for railroad ton-mile costs and truck ton-mile costs. These values are based on conversations with traffic representatives of grain shippers. The example spreadsheet uses a value of 0.03 cents per ton-mile for rail and 0.079 cents per ton-mile for truck. These rates are reflective of relatively short haul distances of about 100 miles. Representative rates for longer hauls (500 miles or so) are about 0.019 cents per ton-mile for rail and 0.057 cents per ton-mile for truck. Default factors representing very general, nationwide averages are also provided. The railroad cost/ ton-mile default factor is from *Railroad Facts – 2001 Edition*; Association of American Railroads. The truck cost/ton-mile default factor is based on a five-axle combination truck having a 28.5-ton capacity, and is from *Paying Our Way; Special Report 246*; Transportation Research Board.

Inputs required:
- Annual tonnage shipped
- Miles shipped (Rail and Truck)
- Transportation cost per ton mile
  - Short Haul (100 miles ±)
    - Rail - 0.03
    - Truck - 0.079
  - Longer Haul (500 miles ±)
    - Rail - 0.019
    - Truck - 0.057
  - National Default Value
    - Default value, Rail - 0.025
    - Default value, Truck - 0.043

Output: Annual project transportation costs

No-Project Transportation Cost

This spreadsheet accounts for the truck transportation that would take place if short line railroad service were discontinued.

Inputs required:
- Annual tonnage shipped
- Miles shipped
- Transportation cost per ton mile
  - Truck - 0.079

Output: Annual No-Project transportation costs

Increased Transportation Cost

This spreadsheet determines the added transportation costs by subtracting the total cost from the Project transportation spreadsheet from the total cost on the No-Project transportation spreadsheet.

Inputs required: Cost totals from the Project and No-Project spreadsheets

Output: Increased transportation costs

Economic Impact

Increased Transportation Cost is used as an input to determine annual economic loss. Increased transportation cost is a primary impact because farmers, through reduced prices for their commodities, most frequently absorb that cost.

Secondary impacts occur when direct impacts are spent and re-spent within the local economy. In the absence of increased transportation costs, the money that would have been spent on those costs is considered discretionary income for the farmers—money that can be spent for eating out, leisure time activities, clothes, etc. In essence, the increased transportation cost is viewed as economic leakage from the local community.

Secondary impacts are quantified in the methodology by using a factor of 2 multiplied against increased transportation cost. The result represents the amount of economic activity that would have been created if the direct impacts remained in the local economy. The factor is based upon data presented in *Economic Impact of Railroad Abandonment: Carrington-to-Turtle Lake Rail Line*; North Dakota State University.

Inputs required: Increased transportation costs - from previous table

Output: Annual economic impact (loss)

Employment and Business Costs

Cessation of rail service may cause unemployment and/or a business to relocate. On the other hand, keeping rail service may help attract business and maintain employment. The spreadsheets at the end of this appendix account for these possibilities. Data from the railroad and the shippers, supplemented by field research in the local communities, should provide the input information for these spreadsheets.

Unemployment Cost

Inputs required: Numbers of job losses
Average weeks out of work
Average weekly pay

Output: Total lost labor

Business Relocation

Inputs required: Cost of moving equipment and inventory
Cost of moving key employees
Breaking current lease

Output: Total relocation costs

Employment Benefits

Inputs required: Number of jobs gained
Increase in working weeks (per year)
Average weekly pay

Output: Total gained labor

HIGHWAY BENEFITS / COSTS

Increased Road Maintenance & Infrastructure Projects

The costs associated with shifting traffic from rail to truck, along rural and in some cases urban roadways, should include those associated with increased roadway maintenance due to truck traffic's high impacts on roadways. Truck trips are determined by dividing the annual commodity tonnage by a factor of 28.5. This factor represents the tons capacity of a five-axle combination truck. Default factors for the maintenance costs of various classes of highways are presented below. (Tolliver: *Agriculture Transportation for the 21st Ce*ntury, 7/27/98). Based on the assumption that agribusiness trucks will return empty, truck trips should be calculated as one-way. The wear and tear to highways caused by empty trucks is generally offset by user taxes.

The spreadsheet provides a column to account for capital infrastructure improvements that may be required for the railroad and highway network. The cost of infrastructure projects must be calculated separately. Rehabilitation costs to bring a railroad to 286,000 lbs. capability can be estimated by using the methodology presented in the Indiana DOT's *Rail Plan - 2002*. It should be noted that the methodology spreadsheets reflect annual impacts; therefore, infrastructure capital costs should be the annual amortized amount.

Inputs required:
- Number of truck trips (per segment)
- Distance (miles)
- Highway Maintenance cost per mile
  - Default values
    - $0.51 – Minor Arterial
    - $1.71 – Major Collector
    - $2.67 – Minor Collector
- Cost of roadway/railway infrastructure projects

Output: Total Cost, and Additional Infrastructure Costs

Road and Fuel Tax

Additional truck traffic results in increased user revenues from the trucking industry, including fuel taxes. A default value of 5.6 miles per gallon is used, which is based on the performance of a truck having a loaded capacity of 28.5 tons.

Inputs required:
- Number of truck trips (per segment)
- Distance (miles)
- Miles per gallon of diesel fuel
  - Default value - 5.6 mpg
- Diesel fuel tax (per gallon)

Output: Total tax revenue without project

ENVIRONMENTAL

Air Quality & Emissions

In this series of spreadsheets a comparison of emissions between Project and No-Project is developed. The railroad fuel efficiency factor represents the gross ton-miles per gallon of fuel used. In the year 2000 this factor was 826.05 (*Analysis of Class I Railroads, Year 2000*: Association of American Railroads). Emissions factors for rail and trucks are those used in performing similar analysis as presented in the Railroad Control Application Environmental Report (CSX/NS – Conrail, Proposed Action).

Inputs required:	Tonnage shipped by truck Tonnage shipped by rail
Output:	Total gallons of diesel fuel consumed / Emissions increase

---

Parsons developed this Railroad Benefit Funding Methodology as a component of the Indiana Rail Plan – 2002

Economic Benefits and Costs

Project (Railroad continues in business)

	Railroad Cost Ton/mile	Railroad Miles	Annual Railroad Tons	Total Railroad Cost	Truck Cost Ton/mile	Truck Miles	Annual Truck Tons	Total Truck Cost	Total Transport Cost
Corn	$0.030	33	65,000	$64,350	$0.079	5	65,000	$25,675	$90,025
Wheat	$0.030	16	100,000	$48,000	$0.079	4	100,000	$31,600	$79,600
				$0				$0	$0
				$0				$0	$0
				$0				$0	$0
				$0				$0	$0
TOTAL									**$169,625**

No Project (Railroad abandoned, transfer to trucks)

	Truck Cost Ton/ Mile	Truck Miles	Annual Truck Tons	Total Transport Cost
Corn	$0.079	100	65,000	$513,500
Wheat	$0.079	75	100,000	$592,500
	$0.000			$0
	$0.000			$0
	$0.000			$0
	$0.000			$0
TOTAL				**$1,106,000**

Inreased Transportation Cost

Total Transportation Costs		Increased Transport Costs
Project	No Project	
$169,625	$1,106,000	**$936,375**

Economic Impact

Increased Transport Costs	Secondary Impacts	Annual Economic Loss Impact
$936,375	$1,872,750	**$2,809,125**

Economic Benefits and Costs (Continued)

Unemployment Costs -
No Project (Railroad abandoned, transfer to trucks)

Business	* Number of Jobs Lost	* Average Weeks out of Work	* Average Weekly Pay	Total Lost Labor Output
X	12	6	$500	**$36,000**
Y	20	6	$500	**$60,000**
				$0
				$0
				$0
TOTAL				**$0**

Business Relocation -
No Project (Railroad abandoned, transfer to trucks)

Business	** Cost of Moving Equipment and Inventory	** Cost of Moving Key Employees	** Breaking Current Lease	Total Cost for Relocation of Businesses
X	$8,000	$80,000	$36,000	**$124,000**
Y	$22,000	$62,000	$12,000	**$96,000**
				$0
				$0
				$0
TOTAL				**$220,000**

Employment Benefits -
Project (Railroad continues in business)

Business	* Number of Jobs Gained	* Increase in Working Weeks (per year)	* Average Weekly Pay	Total Gained Labor Output
X	42	34	$500	**$714,000**
Y	21	26	$500	**$273,000**
				$0
				$0
				$0
TOTAL				**$987,000**

NOTES

* Data can be obtained from the local areas unemployment office and from local communities.
{For rural communities information may also be obtained from the U.S. Department of Agriculture and the Rural Business - Cooperative Service
** Local communities and businesses impacted by the shipping industry
*** Data may also be obtained from the US Census

Highway Benefits and Costs

Increased Road Maintenance & Infrastructure Projects - Primary

	Comodity Annual Tons		Tons/ truck	* Number of Truck Trips (per segment)		Distance (miles)		Annual Truck Miles		** Roadway Maintenance Cost per Mile		Infrastructure Projects Roadway**	Rail	Total Cost	
	No Project	Project		No Project	Project	No Project	Project	No Project	Project	No Project	Project	No Project	Project	No Project	Project
Corn	65,000	65,000	28.5	2,281	2,281	100	5	228,070	11,404	$2.67	$1.71	0	0	**$608,947**	**$19,500**
Wheat	50,000	100,000	28.5	1,754	3,509	65	4	114,035	14,035	2.67	1.71			**$304,474**	**$24,000**
Wheat	50,000		28.5	1,754	0	10		17,544	0	1.71				**$30,000**	**$0**
			28.5	0	0			0	0					**$0**	**$0**
			28.5	0	0			0	0					**$0**	**$0**
			28.5	0	0			0	0					**$0**	**$0**
			28.5	0	0			0	0					**$0**	**$0**
TOTAL								**359,649**	**25,439**					**$943,421**	**$43,500**

Road and Fuel Tax - Secondary

	* Number of Truck Trips (per segment)		Distance (miles)		*** Miles per Gallon of Diesel Fuel	**** Fuel Tax (per gallon)	Total Tax Revenue	
	No Project	Project	No Project	Project			No Project	Project
Corn	0	2281		5	5.6	0.04	**$0**	**$81**
Wheat	0	3509		4	5.6	0.04	**0**	**100.257**
Corn	2,281		100		5.4	0.04	**1689.63**	**0**
Wheat	1,754		65		5.4	0.04	**844.519**	**0**
Wheat	1,754		10		5.4	0.04	**129.926**	**0**
					5.4	0.04	**0**	**0**
					5.4	0.04	**0**	**0**
					5.4	0.04	**0**	**0**
TOTAL							**$2,664**	**$182**

Increase in the number of truck registrations if the railroad line was abandoned must be independently calculated.

NOTES

* Local business and shipping companies
** State Department of Transportation
*** Department of Energy
****Federal, State and local government tax information (Federal tax on diesel fuel - .243 cents per gallon, State average - .19)

* Environmental Impacts

Project (Railroad continues in business)

	Railroad Miles	Annual Tons	Annual Ton Miles	Fuel Efficiency Factor	Total Railroad Gallons Consumed	Factored Railroad Gallons Consumed (X 1,000)
Corn	33	65,000	2,145,000	826.05	2,597	2.60
Wheat	16	100,000	1600000	826.05	1,937	1.94
	1	1	1	1	1	0.00
	1	1	1	1	1	0.00
	1	1	1	1	1	0.00
	1	1	1	1	1	0.00
TOTAL						4.54

Air Quality & Emissions

Total Factored Railroad Gallons Consumed (X 1,000)	** Emission Factors (units of pounds of pollutant per 1000 gallons of fuel consumed)					Emission (per Ton)				
	Carbon Monoxide	Nitrogen Oxides	Sulfur Dioxide	Particulate Matter	Lead	Carbon Monoxide	Nitrogen Oxides	Sulfur Dioxide	Particulate Matter	Lead
4.54	62.90	566.40	36.70	14.30	0.0012	**0.14**	**1.29**	**0.08**	**0.03**	**0.00000**

No Project (Truck)

Annual Truck Miles			** Emission Factors (grams / truck mile)					Emission (per Ton)				
No Project	Project	Increased Truck Miles	Carbon Monoxide	Nitrogen Oxides	Sulfur Dioxide	Particulate Matter	Lead	Carbon Monoxide	Nitrogen Oxides	Sulfur Dioxide	Particulate Matter	Lead
359,649	25,439	334,210	8.63	19.68	0.64	2.29	0.0001	**3.18**	**7.24**	**0.24**	**0.84**	**0.00004**

Emissions Increase	Carbon Monoxide	Nitrogen Oxides	Sulfur Dioxide	Particulate Matter	Lead
No Project (Truck)	3.18	7.24	0.24	0.84	0.00004
Project (Railroad in service)	0.14	1.29	0.08	0.03	0.00000
Emission Increase	**3.03**	**5.96**	**0.15**	**0.81**	**0.000034**

NOTES

* All environmental information could be obtained from contacting the Environmental Protection Agency

** United States Environmental Protection Agency, February 11, 1997. 40 CFR Parts 85, 89 and 92. Emission Standards for Locomotive and Locomotive Engines; Proposed Rule.